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## Facsimile Transmittal Sheet

To: EXAMINER D. DEO	From: JOHN TRAVIS
Company: PTO	Date: 5-17-01
FAX Number: 703-872-9436	Total No. of pages including cover: 6
Phone Number: 703-305-0515	Sender's Reference Number: 042390-P6147
RE: EXHIBIT FOR 131 DECLARATION	Your Reference Number: 09/280, 268

### Notes/Comments:

EXHIBIT 1 FOR 131 DECLARATION  
FILED ON 4-4-01.

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TMG INVENTION DISCLOSURE, Rev 1, 2/98

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9373

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It is important to provide accurate and detailed information on this form (fill in ALL areas under Inventor(s)). The information will be used to evaluate your invention for possible filing as a patent application. When completed, please return this form to Janice Boulden, Intel Legal Department at JF3-147. You can submit electronically if all of the information is electronic, including drawings and supervisor approval. If you have any questions regarding this form or to whom it should be forwarded, please call 503-264-0444.

Fill out the below and follow the instructions:

1.	Field of the Invention:	Semiconductor Process: device and integration <input checked="" type="checkbox"/> Semiconductor Process + Equipment: thin films Semiconductor Process + Equipment: etch/litho Circuit Design Flash Test CDN (Q&R) Packaging Boards/Cartridge Automation Other
2.	Concise Title of Invention: Ceric-Ion Based Slurry for Metal CMP	

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Citizenship: US	Supervisor Name: Kenneth Cadien	Supervisor Phone: (503) 613 - 0577	Supervisor M/S: RA1-232	
Group Name: <u>TMG</u> Division Name: <u>ATD</u> PTD <input checked="" type="checkbox"/> CTM <input type="checkbox"/> CR <input type="checkbox"/> STTD <input type="checkbox"/> CQN <input type="checkbox"/> SMTD <input type="checkbox"/> TCAD <input type="checkbox"/> Other? <input type="checkbox"/>	BUM Presenter:	Inventor Signature:  <i>Anne E Miller</i>		

Name: Daniel Feller		SS# 543-38-7895	Empl.# 10064105	M/S: RA1-232
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Group Name: <u>TMG</u> Division Name: <u>ATD</u> PTD <input checked="" type="checkbox"/> CTM <input type="checkbox"/> CR <input type="checkbox"/> STTD <input type="checkbox"/> CQN <input type="checkbox"/> SMTD <input type="checkbox"/> TCAD <input type="checkbox"/> Other? <input type="checkbox"/>	BUM Presenter:	Inventor Signature:  <i>Daniel Feller</i>		

Name: <u>C</u> Kenneth Cadien		SS# 357-54-8082	Empl.# 10056264	M/S: RA1-232
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Citizenship: USA	Supervisor Name: Leo Yau	Supervisor Phone: (503) 613 - 6679	Supervisor M/S: RA1-232	
Group Name: <u>TMG</u> Division Name: <u>ATD</u> PTD <input checked="" type="checkbox"/> CTM <input type="checkbox"/> CR <input type="checkbox"/> STTD <input type="checkbox"/> CQN <input type="checkbox"/> SMTD <input type="checkbox"/> TCAD <input type="checkbox"/> Other? <input type="checkbox"/>	BUM Presenter:	Inventor Signature:  <i>Kenneth C. Cadien</i>		

**(PROVIDE SAME INFORMATION AS ABOVE FOR EACH ADDITIONAL INVENTOR)**

5.	<b>HAVE YOUR SUPERVISOR READ, DATE AND SIGN COMPLETED FORM (use first inventor's supervisor if multiple inventors)</b>		
	DATE: <u><del>                    </del></u>	SUPERVISOR NAME: Leo Yau <i>Leo Yau</i>	
	BY THIS SIGNING, I (SUPERVISOR) ACKNOWLEDGE THAT I HAVE READ AND UNDERSTAND THIS DISCLOSURE, AND RECOMMEND THAT THE HONORARIUM BE PAID.		
6.	Has subject matter of present disclosure been disclosed or will it be disclosed outside Intel? If yes, explain and give date: (Give expected tape out date if applicable) No		

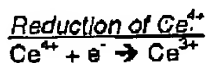
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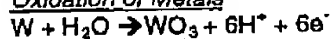
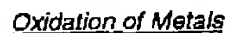
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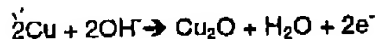
13. a. Is the invention experimentally verified? Yes, for Cu polish.  
Slurry based on 5 wt%  $\text{SiO}_2$  and 0.1 M  $(\text{NH}_4)_2\text{Ce}(\text{NO}_3)_6$  have been prepared and high rates demonstrated without and with BTA on Cu wafers.
- b. Is the invention verified with simulation? No
- c. If neither a. or b. above, then you can get a patent on the concept, but please explain the technical basis to justify that your invention will work (use extra space if necessary):
- The electrochemical potential for  $\text{Ce}^{4+}$  reduction is thermodynamically favorable to oxidize both Cu and W. Since this oxidant has been demonstrated to be kinetically favorable for Cu, it should also be kinetically favorable for W.



$$E = 1.72 \text{ eV}$$



$$E = 0.09 \text{ eV}$$



$$E = 0.36 \text{ eV}$$

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15.

Drawings (use as many pages as needed)  
(PLEASE DO NOT MAKE COLOR DRAWINGS)

**Figure 1. Present State of the Art** (often this is helpful to explain your invention, but it is not required).

W Polish Slurries:

KD100C → (1) Requires CDS, (2) Tends to emit HCN as it ages  
SW2000 (Cabot) → (1) Two components that must be mixed on site, (2) Expensive, (3) Can not recycle

Cu Polish Slurries:

KD100Cu → (1) Requires CDS, (2) Tends to emit HCN as it ages  
EPC-4100 → (1) Two components that must be mixed on site and then incubate for 24 hrs, (2) Rate is not stable, (3) Expensive

**Figure 2. The Invention** (use additional figures as needed to show details and additional embodiments)

W Polish:

- As inexpensive as KD100C, ~ ½ the cost of SW2000 (Cabot)
- No waste treatment
- Single package/Single component

Cu Polish:

- No incubation period
- Stable Rate
- Single Package/Single Component
- At least ½ the cost of EPC-4100 (Cabot)

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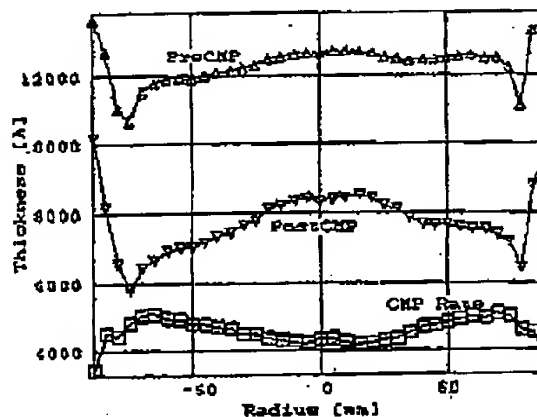
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Leo Yau Special Polishing Param

15:00 2/17/98

Lot #:   
 Operator: Dan Feller   
 PolishTime(sec) 60   
 PolishPress(psi) 6.5   
 Spindle RPM: 310   
 Water RPM: 10   
 Polish Recipe: Slurry3   
 Pad: ic1000/suba4   
 Backing:   
 Pad Condition: 1 hr   
 Notes: 0.01M BTA 400 ml/h



	Stat	Avg	Dev	σ	Sigma %	Min	Max	%
PreCMP:	37	12396	644	1631	13.16%	11015	13670	10.75%
PostCMP:	37	7748	869	2807	33.68%	5920	10219	27.40%
CMPRate:	37	4575	345	1094	23.91%	3457	5098	19.10%

Figure 1. Polish rate profile for a blanket Cu wafer using a  $Ce^{4+}$  based slurry containing 0.1 M BTA and 5 wt%  $SiO_2$ .